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(54) Method and apparatus for blood sampling

(57) A blood sampling kit, for example of the "Vacutainer" (RTM) type, comprises an open-ended syringe barrel and a blood sample receiver closed by a puncturable membrane and containing sterile gas at sub-atmospheric pressure, is provided with a double ended needle having a central boss and one end closable by a removable sleeve, and a needle protector attached or clipped to the boss and hingeable between open and closed positions.

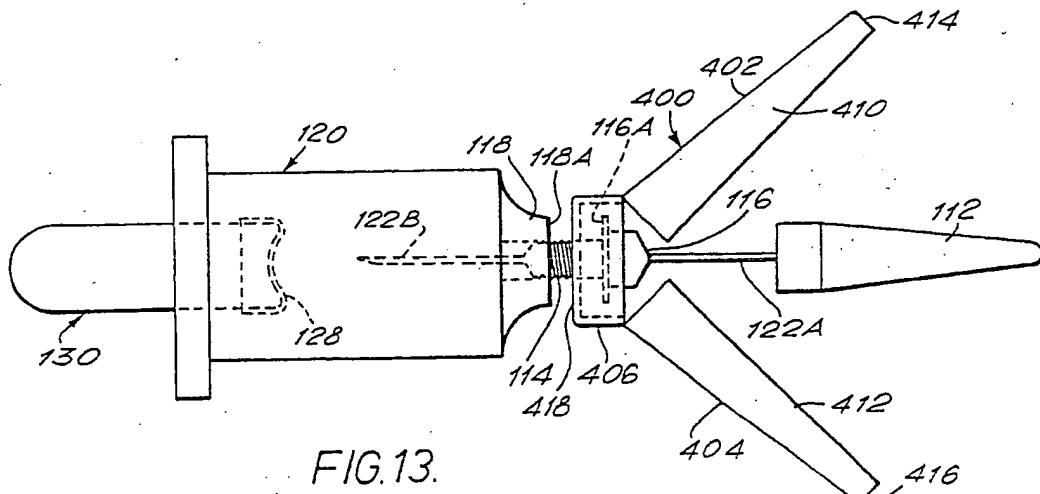


FIG. 13.

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FIG.1.

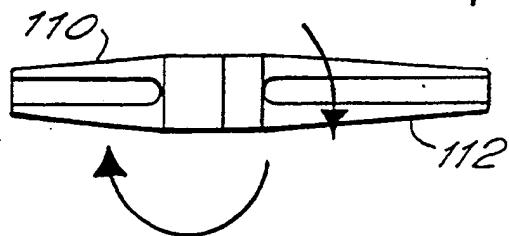


FIG.2.

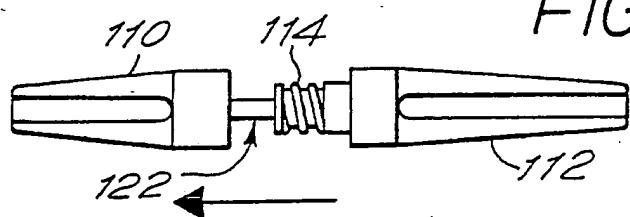


FIG.3.

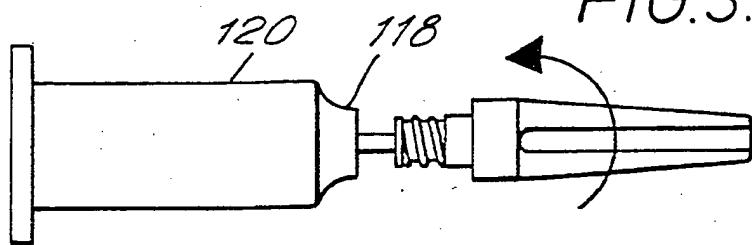
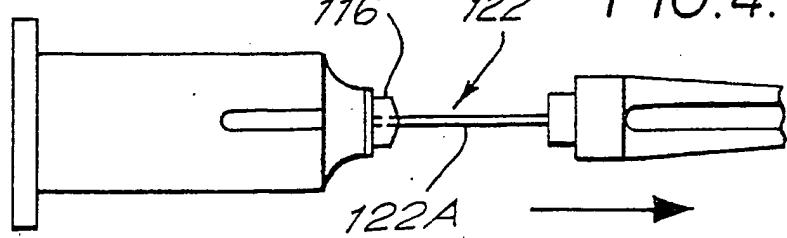
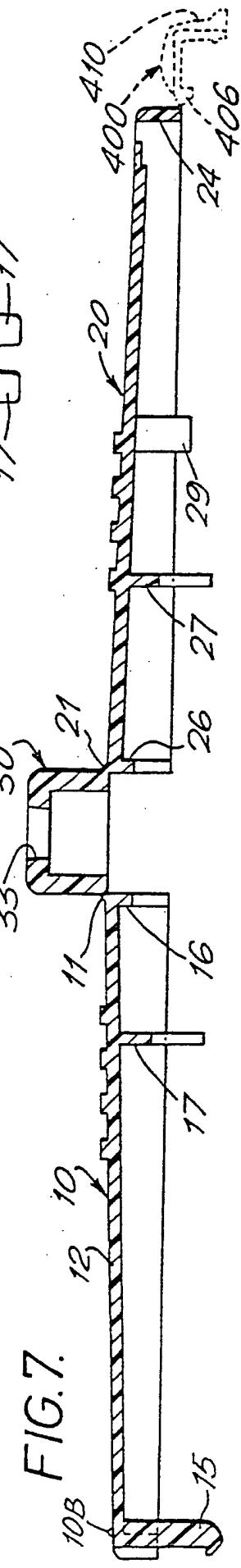
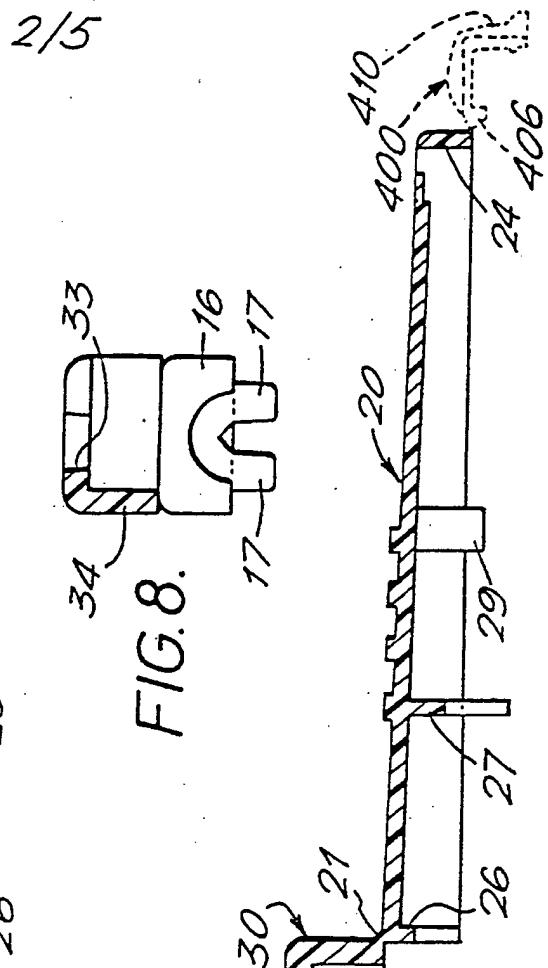
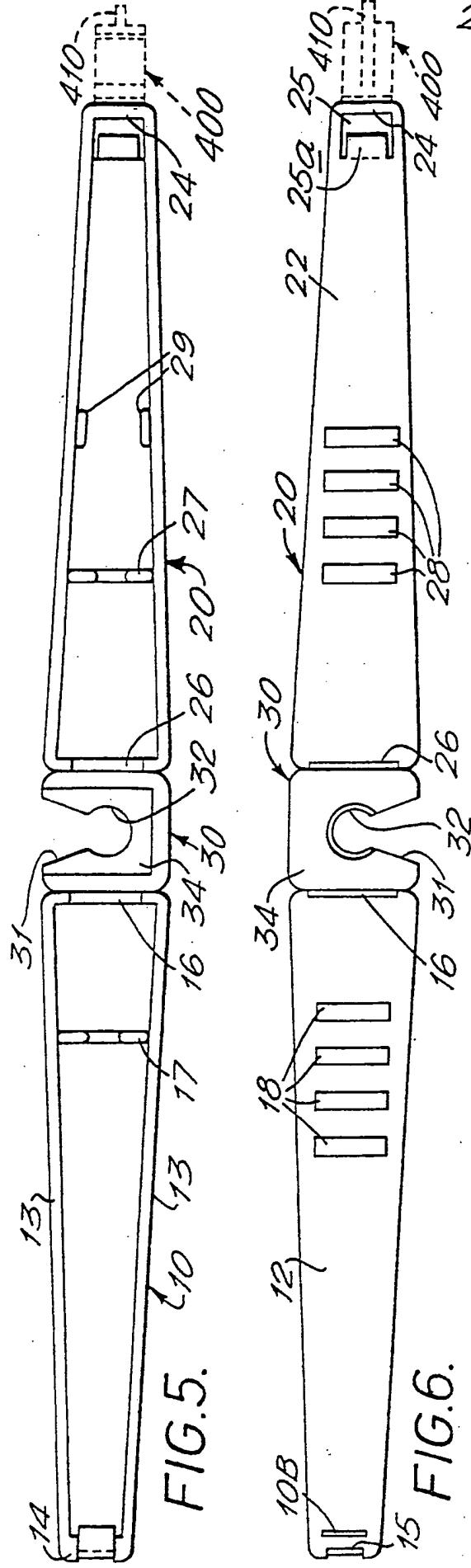


FIG.4.





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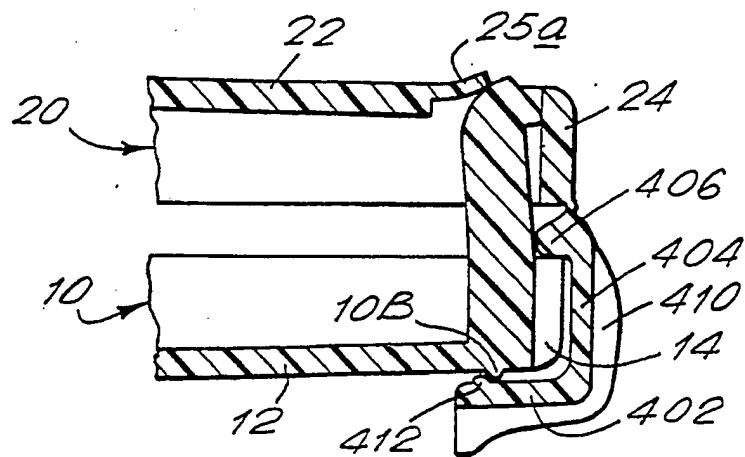


FIG. 9.

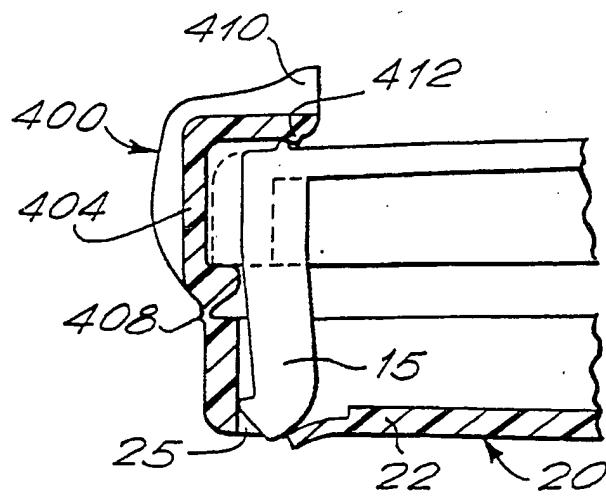


FIG. 10.

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FIG.11.

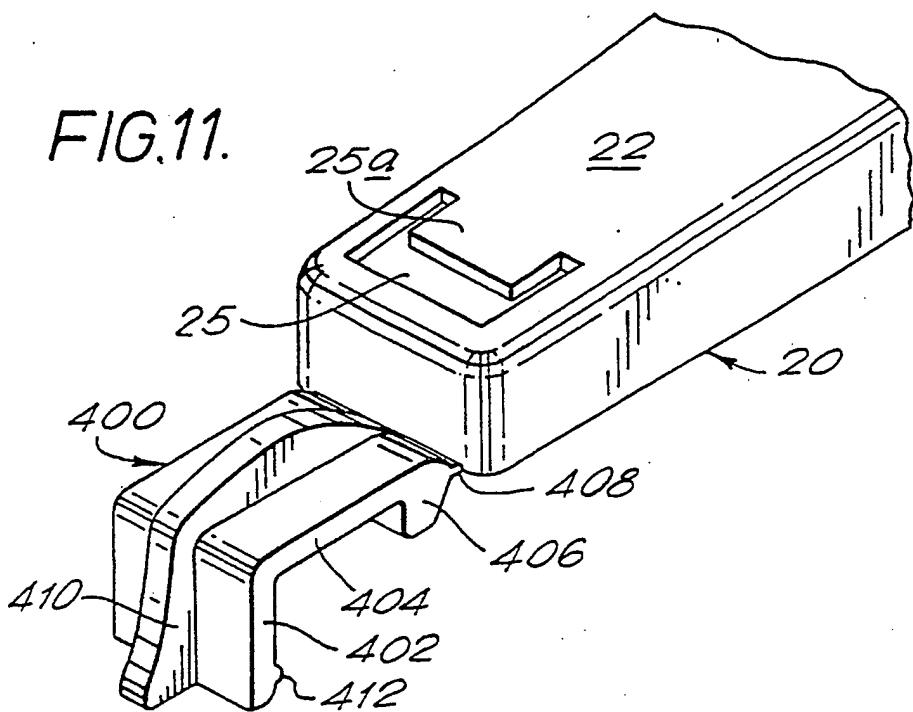
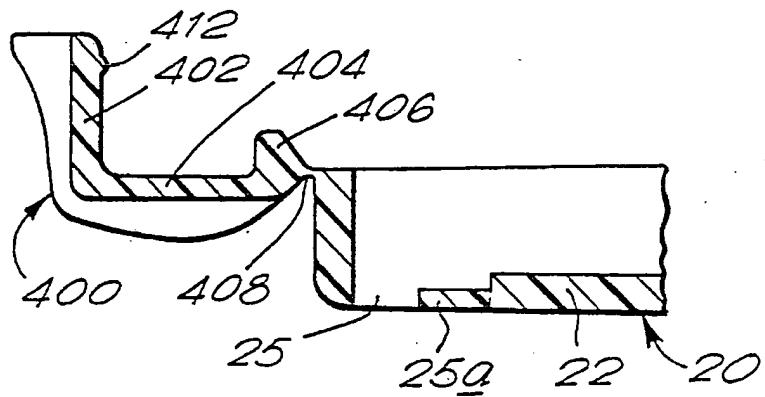


FIG.12.



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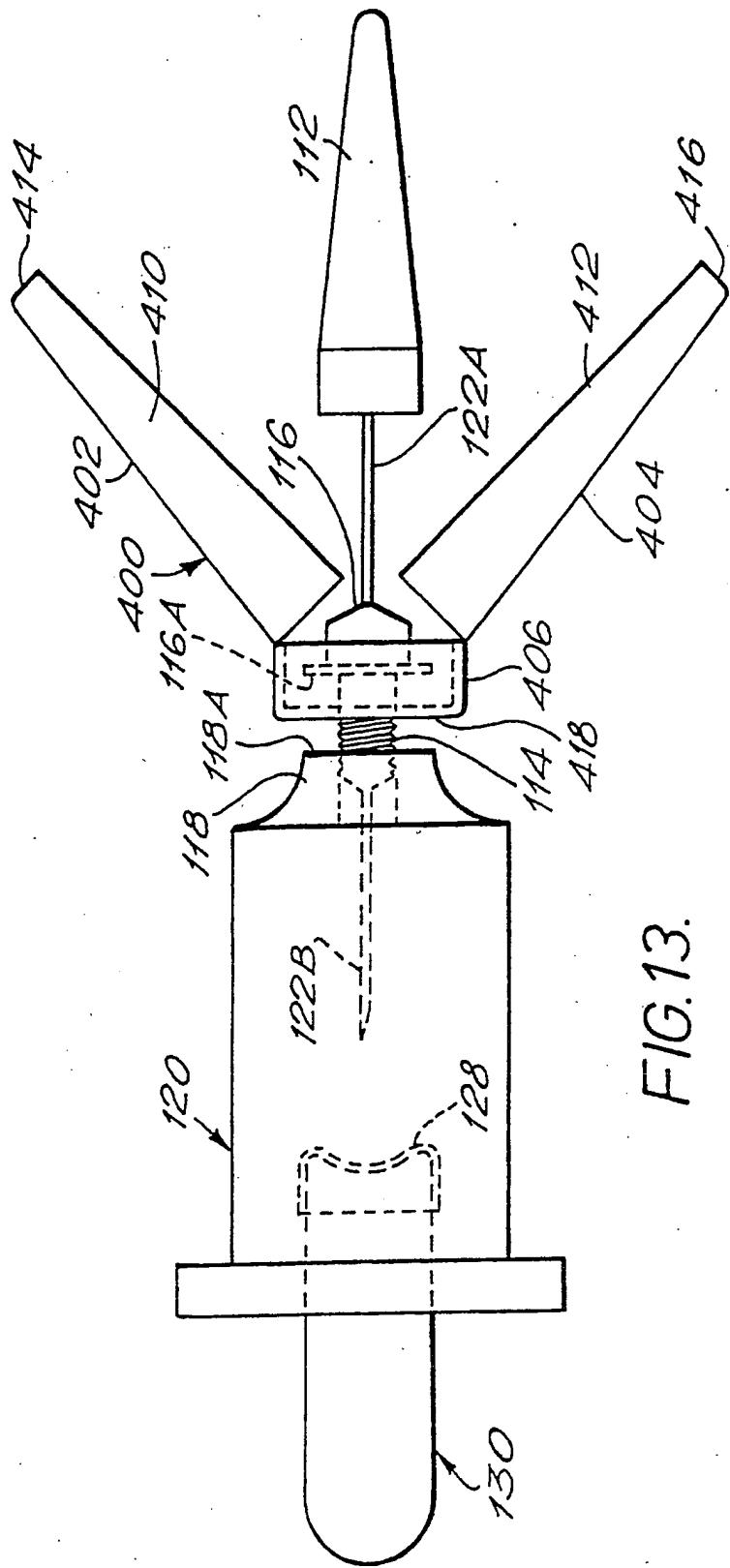


FIG. 13.

METHOD AND APPARATUS FOR BLOOD SAMPLING

This invention relates to a needle protector and a method of using a needle protector in the extraction of a blood sample from a patient.

In my U.K. Patent Application numbers 8928956, 7 and 9, needle protectors are disclosed having a central part and two housing parts which can be folded together to a mutually closed position and moved apart to expose the needle.

One of the major risks of contracting or spreading the HIV virus or Hepatitis occurs when blood sampling takes place. A major supplier of a blood sampling system in U.K. is Becton Dickinson. Their system is known as the "Vacutainer" system. A needle protector according to U.K. Patent Application No. 89 28957 or 9 can be used without modifying their system.

According to the present invention, it is possible to employ such a needle protector, and secure the advantages of avoidance of needle stick injuries and prevention of second use of needles, when the needles are used in an established "Vacutainer" system of withdrawing a blood sample from a patient.

According to one aspect of the invention, there is provided a blood sampling kit comprising:-

an open ended syringe barrel, a double ended needle having a central boss and one end closable by a removable sleeve, a blood sample receiver closed by a puncturable membrane and containing sterile gas at a pressure substantially negative relative to atmospheric, and a needle protector having a central part attached to or clipped on to the central boss, the protector being hingeable between closed and open positions and when closed defining a substantially closed chamber for containing part of a needle.

The invention will be better understood from the following description of a preferred embodiment thereof, given with reference to the following particular description and accompanying illustrative drawings, in which:-

Figures 1-4 illustrate the use of the established "Vacutainer" system;

Figures 5-12 are views of an embodiment of needle protector shown in U.K. Patent Application No. 89 28959. Note that in the description of these figures the reference numerals employed are those of the '959 application.

Figure 13 illustrates the protector assembled together with components of the "Vacutainer" system for operating a method according to the present invention.

The "Vacutainer" system includes a syringe barrel and a needle holder containing a double ended needle, one end of which is covered with a rubber closed-ended sleeve. The needle has a passageway completely therethrough. One end of the needle is closed by the rubber sleeve. There is also a protective cap for each end of the needle. The needle holder is threaded to engage within a complementary internal thread on one end of a syringe barrel which has an open rear end. In addition there is a glass or plastics sample receiver whose top is covered by a puncturable membrane for example, made of rubber. This receiver is sterile and contains a vacuum.

In the conventional use of this system the nurse or user takes the needle holder packet, removes the cap from one end to expose the rubber covered needle and then screws the threaded portion into the threaded (front end) part of the syringe. The cover protecting the opposite end of the needle is then removed and this end of the needle inserted into the person from whom the blood sample is to be taken. The receiver is then pushed onto the other end of the needle, so causing that end of the needle to puncture firstly the end of the sleeve and then the rubber membrane. The interior of the passageway through the double needle is thus subjected to the strong negative pressure within the receiver and blood is consequently sucked out of the patient and into the receiver.

At this time, according to present conventional procedure, the nurse or medical auxiliary or practitioner has to replace the needle packaging in order to cover the used needle; during this process there is a high probability of stick injuries. By the use of a method according to the present invention, the chance of such injuries is greatly reduced. Prior to the threading of the needle holder into the syringe, the central part of a needle protector according to any one of U.K. Patent Application Nos. 8928956, 8928957 and 8928959 is clipped or snapped onto a suitable portion of the needle holder (needle boss), in the same way as a needle protector is clipped on to a syringe nozzle as described in any

one of the said three U.K. patent applications.

Referring now to Figures 1-4, Figure 1 shows a needle holder containing a doubled ended needle, each end of which is completely enclosed by a protective cap. One such cap 110 (the left hand end as in Fig. 1) is fitted on by screwthreading onto a threaded part 114 and the other cap 112 is a push fit over a central boss 116 from which the part 114 projects. The hollow metal double needle 122 passes through the centre of this boss 16. Figure 2 illustrates the lefthand cap 110 being withdrawn after being unthreaded. The threaded part is then screwed into a threaded collar 118 of the syringe-like holder 120. The next stage in the use of the conventional "Vacutainer" system is the pulling off of the other cap 112 to expose the needle portion 122A ready to insert into the patient from whom a sample is to be taken. The sample is taken by pushing the receiver 126 onto the needle portion 122B within the syringe body. In this operation the needle portion 122B punctures both the rubber sleeve thereon (not illustrated in fig. 13) and the membrane 128 (seen in Fig. 13). Due to the reduced pressure in the receiver, blood is thus sucked into the sample receiver 130. Of course the forward end of the receiver 130 is closed by the membrane 128 until it is punctured.

In one advantageous modification, the threaded part of needle boss 116 could be reconstructed or lengthened to permit the needle protector to be assembled conjointly with the double needle and to serve as a protector for the needle during storage, delivery, and prior to use.

In the description from this point onwards, until the end of the description of Figs. 11 and 12, the reference numerals used are those on Figs. 5-12.

Referring now to Figures 5-9, the illustrated needle protector is integrally moulded from a synthetic plastics material such as polypropylene, and has a first housing part 10, a second housing part 20, and a central part 30. The parts 10 and 20 are connected to the part 30 by integral plastics hinges 11 and 21. The first housing part 10 has a base 12, side walls 13, and a wall 14 at its free end which carries a latch portion 15 of a latching means. A needle support structure is formed by a wall 17 which is shaped generally as a saddle. In use this wall in conjunction with the wall 27 (to be later described) locates the

needle shank when the parts 10, 20 are in their mutually closed condition. The part 10 also has a low wall 16 near the hinge which helps to stiffen and reinforce the structure of the housing. This reinforcement is desirable because the walls are fairly thin, since it is important to save material in a "throw-away" product. The second housing part 20 has a base wall 22, side walls 23, and a free end wall 24. It also has a low wall 26 at the end by which it is joined to the central part 30. An intermediate saddle shaped wall 27 serves as a needle locator and support in a similar way to the wall 17. At the free end, i.e. the end remote from the central part 30, the second housing part 20 has an aperture 25 which serves as a co-operating portion of the latching means. The aperture 25 is preferably approximately rectangular as seen in Figures 5 and 6. There is a thinned portion 25a of synthetic plastics material adjacent thereto. In use, this portion is deformed by entry of the latch member 15 into the aperture 25. After entry of the latch the portion 25a tends to spring back to its normal position, due to the resilience of the plastics from which the protector is made, so preventing or tending to prevent an opening of the coupled housing parts 10 and 20 even if the latch 15 should chance to be forced (e.g. by an accidental impact) in a direction towards the central part 30. The second housing part 20 also includes side plates 29 whose function is to assist in aligning the two housing parts when they are folded into their mutually closed condition.

As shown, the central part 30 is a simple rectangular or square cup shaped plastics member joined by integral hinges 11 and 21 to the housing parts 10 and 20. Its thickness is chosen to be suitable to the relevant dimensions of the threaded portion see (Fig. 13) of boss 16. Central parts of other suitable shapes however may be employed. There is a keyhole slot 31 in the central part 30 as best seen in Figures 5 and 6. The central portion 32 of this slot is preferably circular.

While it is preferred to have a keyhole slot as illustrated at 31 and 32, the invention must not be regarded as limited to this feature. A needle protector according to the invention would work almost as well if it had merely a slot of different shape permitting the protector to be clipped or snapped onto the holder (boss 116). The thickness of the wall portion 34 of the central part 30

can be increased. With the construction as illustrated, this thickness would normally be around 1 mm. to 2 mm., but it can be increased to about 3 mm. to 4 mm., or decreased, if desired. For larger needle bosses, of course different dimensions would be appropriate.

Equally, the length of the housing parts 10 and 20 and the positions of the walls 17, 27 are chosen to be appropriate to a particular standard size of a needle. For larger syringes and longer needles, clearly the dimensions of the needle protector according to the invention would be proportionately increased. For ease of gripping when closing the housing parts to protect and enclose a needle, ribs 18 and 28 respectively are included on the outer side of the housing surfaces 12 and 22.

The clip portion 400 is made integral with the housing part 10. It serves to hold the two housing parts in an almost closed position in which they protect a new sterile needle (Fig. 9). At the same time however, it holds the housing parts 10 and 20 a small distance apart and prevents the latch member 15 passing sufficiently through the aperture 25 so that the hook of the latch passes and engages over the edge of the wall 24. If this occurred, it would defeat the object of this embodiment of the invention because a new sterile needle would then be trapped within the closed housing parts 10, 20. However, with the clip 400 in place, this is prevented and yet the needle protector can readily be opened to expose the new needle ready for use by pivoting the clip about its hinge. After use, the housing parts are fully closed and the latching member 15 is then passed through the aperture 25 and trapped by the deflectible part 25a. The protector (enclosing the used needle) can then be safely discarded. This clip portion 400 is illustrated in Figures 5-12. Figures 10 and 12 are partial cross-sections showing a clip portion 400 of the housing part 10 respectively in its closed and open positions. Figure 11 is a perspective view, inverted compared to Figure 10, showing the clip in its open position attached by an integral plastics hinge to the housing part 10. The clip 400 is substantially L-shaped and has limbs 402 and 404 and a lug 406 at the end of the limb 404 nearer to the integral hinge 408. A rib 410 on the outer side of the limbs 402, 404 gives the clip stiffness against deformation. The clip has a stud or rib 412

towards the free end of its limb 402 which can engage with a stud or rib 12A on the base wall 12 of the housing part 10. The interengagement of these two ribs keeps the clip portion 400 in its closed condition, and the lug 406 on the clip then prevents the latch member 15 moving to its permanently-locked position. However, by flicking back the clip 400 to the position shown in Figure 11, the latch member 15 is freed to pass through the slot 25 and take up a locked position. The closed protector can then be discarded, with no fear that the infected needle can be extracted therefrom (except of course by total destruction of the protector). In the closed position of the clip 400, seen in Figure 9, it will be observed that the limb 402 and its rib 412 embrace and engage with the end of the housing part 10 and its rib 103 while the lug member 406 prevents full closure of the housing parts 10, 20.

The reference numerals used in this description from this point on are those shown in Figs. 1-4 and 13.

Referring now to Figure 13, a needle protector 400 according to any one of the U.K. pending patent applications Nos. 8928957, 8928956 and 8928959 has a pair of housing parts 402, 404 which are joined by integral plastics hinges to a central part 406 which is square or rectangular as seen in end view looking in the direction of the other 408 in Figure 10. The housing parts each have two opposed side walls, one of each pair seen at 410, 412, and end walls 414, 416, and can be mutually closed together to define, together with the central part 406, a substantially closed chamber. As seen in Figure 10, the protective cap 112 is in the course of being removed just prior to insertion of the needle. However, before this stage is reached the holder 120 is fully screwed up tight to the boss 116 clamping the wall 418 of the central part 406 firmly between the end surface 118A of the collar 118 and the surface 116A of the boss 116.

The needle 122A is then inserted into the patient and the receiver 130 pushed onto the needle portion 122B, resulting in the taking of a sample in the manner conventional with the familiar "Vacutainer" system. Once the needle portion 122A is withdrawn, the benefit of the present invention is realised, because the two housing parts 402, 404 are closed together until they snap lock shut by simple squeezing between thumb and finger, while the

remaining fingers, or the other hand, continue to hold the syringe-like holder 120. This squeezing can easily be done without ever bringing the fingers or any part of the nurse's body close to the tip of the withdrawn needle portion 122A. Moreover, as more fully described in U.K. Patent Application No. 89 28957.3, the two housing parts, once closed, fully enclose the needle and stay locked together unless subjected to extreme abuse.

Thus for the first time there is made available, by the combination of the established "Vacutainer" system with a needle protector in the manner disclosed herein, a substantially fully-safe method of blood sampling which can be carried out one-handed if necessary.

CLAIMS

1. A blood sampling kit comprising:-

an open ended syringe barrel, a double ended needle having a central boss and one end closable by a removable sleeve, a blood sample receiver closed by a puncturable membrane and containing sterile gas at a pressure substantially negative relative to atmospheric, and a needle protector having a central part attached to or clipped on to the central boss, the protector being hingeable between closed and open positions and when closed defining a substantially closed chamber for containing part of a needle.

2. A kit according to claim 1 in which the protector is closable in a non-return manner so as to substantially encase a used needle to render repeat use thereof substantially impossible.

3. A blood sampling kit according to claim 2 in which the needle protector is of synthetic plastics material and has a pair of housing parts joined to the central part by integral plastics hinges, and in which a clip is attached to one of the housing parts and is pivotable between an almost closed position and an open position, the clip in its almost closed position holding the housing parts together but a small distance apart.

4. A method of taking a sample of blood from a patient which comprises utilising the well-known "Vacutainer" system characterised in that a needle protector in accordance with either of U.K. Patent Application Nos. 89 28959 or 89 28957 is applied to the central boss of the double needle of the "Vacutainer" system.

(R.T.M.)

5. A blood sampling kit of the "Vacutainer" type characterised in that a needle protector according to either of U.K. Patent Application Nos. 89 28959 and 89 28957 is attached to the central boss of the double needle to protect one end of the double needle prior to use.

6. A blood sampling kit substantially as herein described with reference to and as illustrated in the accompanying drawings.

(R.T.M.)

7. A method of using a "Vacutainer" blood sampling kit substantially as herein described with reference to and as illustrated in the accompanying drawings.